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Cook

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(54) **PORTABLE DEVICE FOR CAPTURING IMAGE AND SOUND DATA INCLUDING COMPACT MEMORY AND BOARD ARRANGEMENT**

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(52) **U.S. Cl.** **386/117**; 386/125; 348/373; 348/374; 358/909.1
(58) **Field of Search** 386/46, 117, 120, 386/52, 55, 125, 126; 348/207, 232, 552, 231, 722, 373, 374; 358/906, 909.1; H04N 5/225

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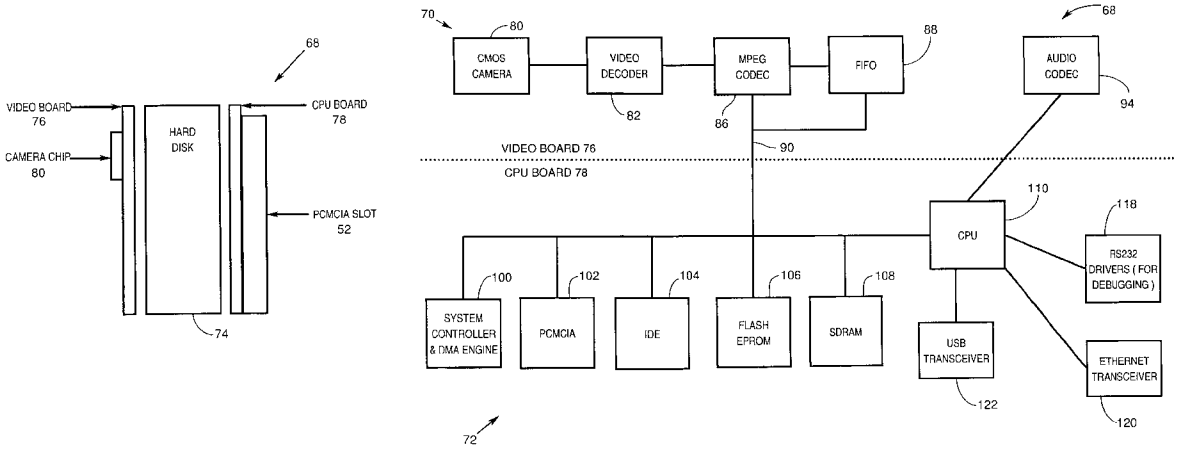
(57) **ABSTRACT**

A device to encode motion and sound data directly into a computer recognizable format and save the encoded data on a hard disk drive in real time includes a housing having operator controls. A lens and at least one microphone are also on the housing. Processor circuitry within the housing communicates with the operator controls and the at least one microphone. The processor circuitry generates motion data in response to light entering the housing via the lens and captures sound data via the at least one microphone in response to user input made via the operator controls. The processor circuitry includes an encoder to encode the motion and sound data directly into a computer recognizable format. The encoded motion and sound data is saved on a hard disk drive within the housing in real time.

12 Claims, 8 Drawing Sheets



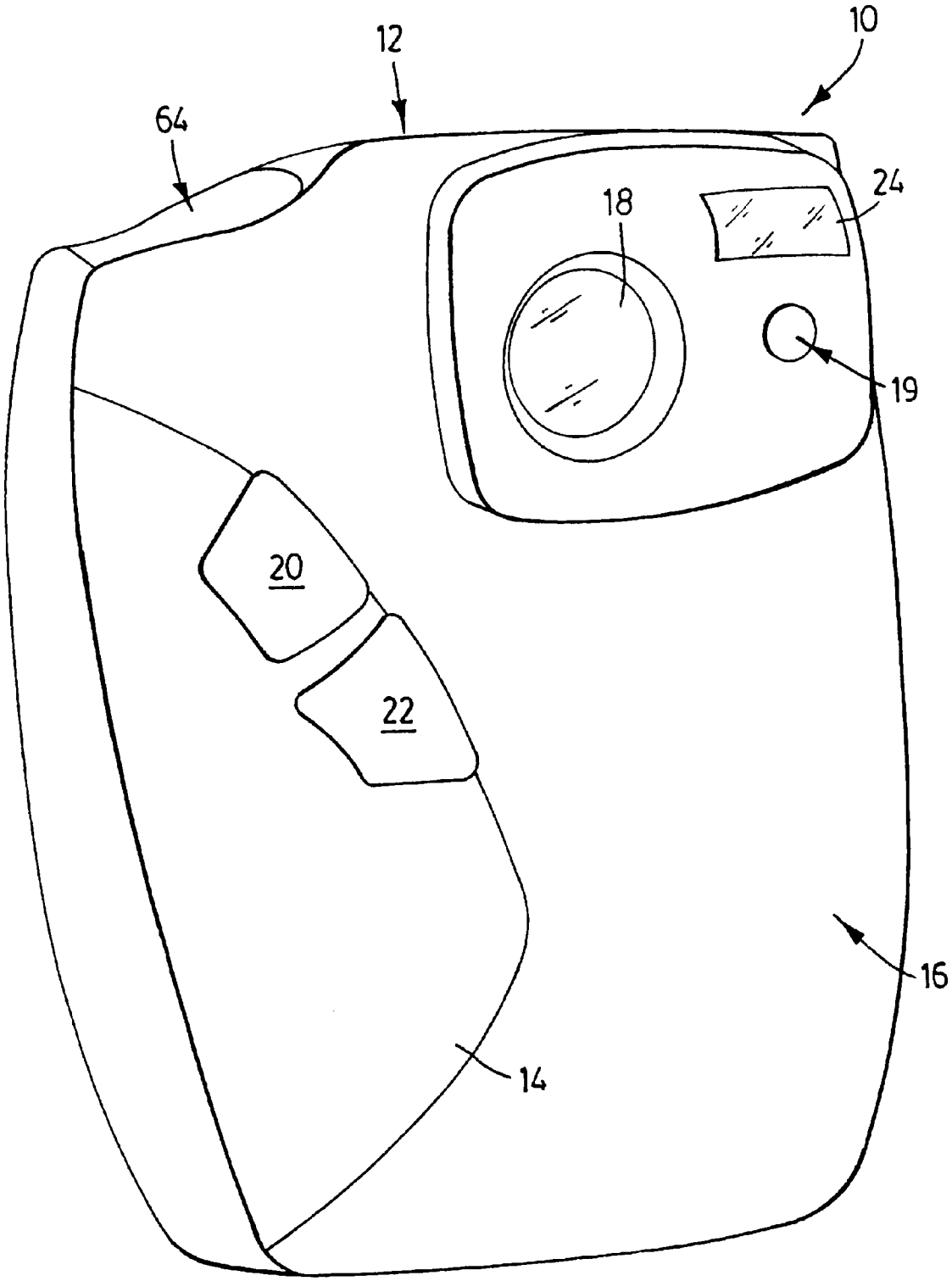


FIG. 1

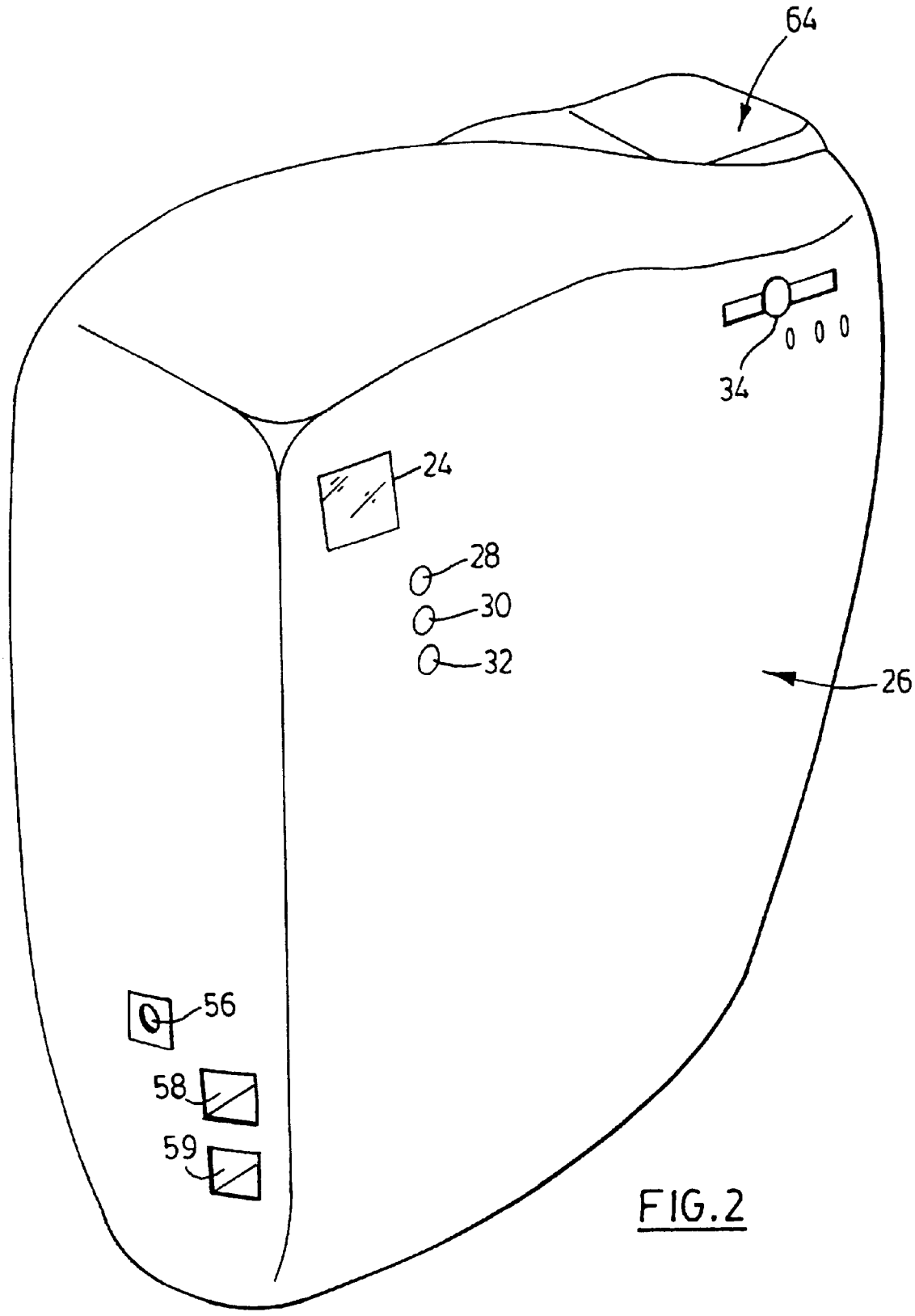


FIG. 2

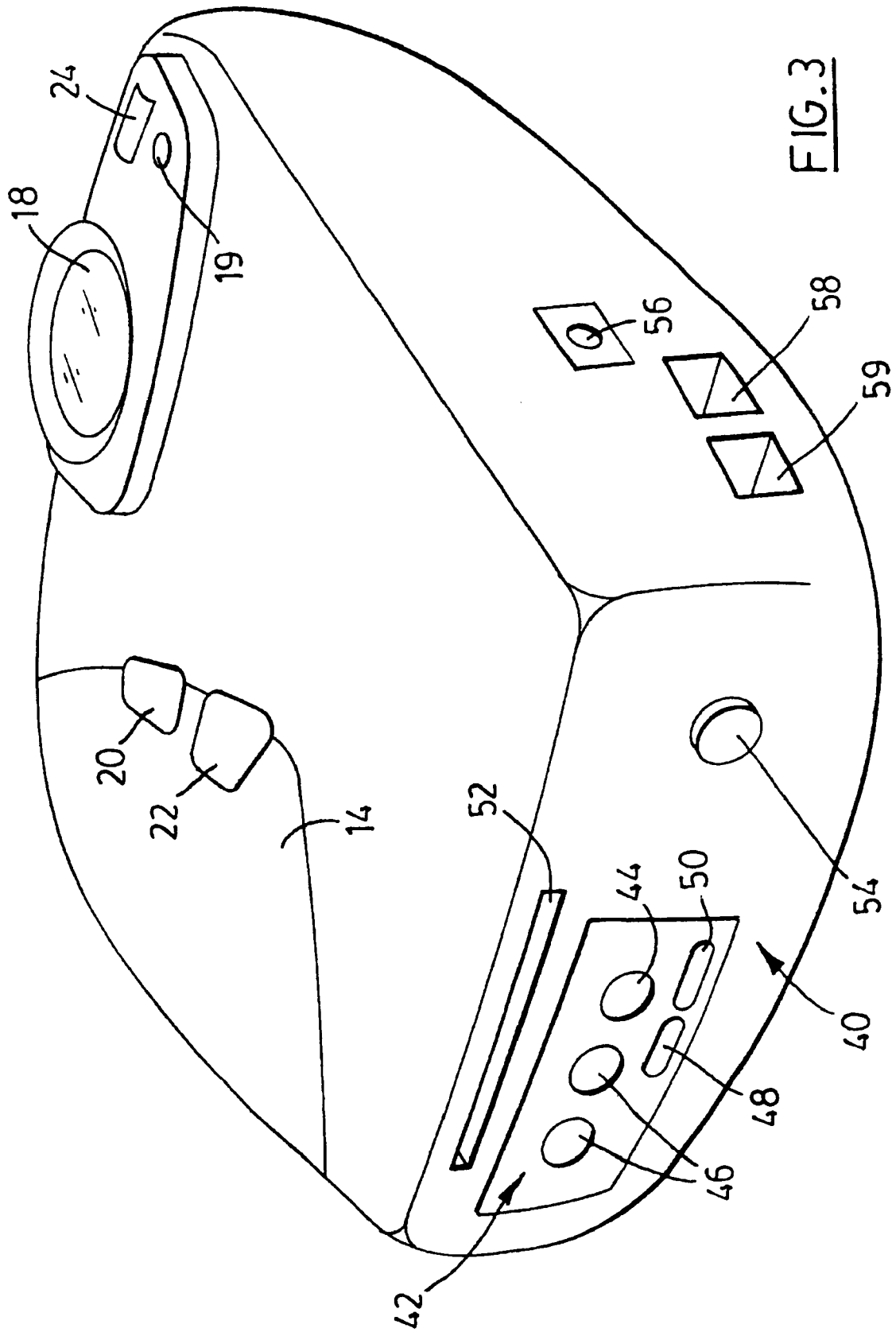


FIG. 3

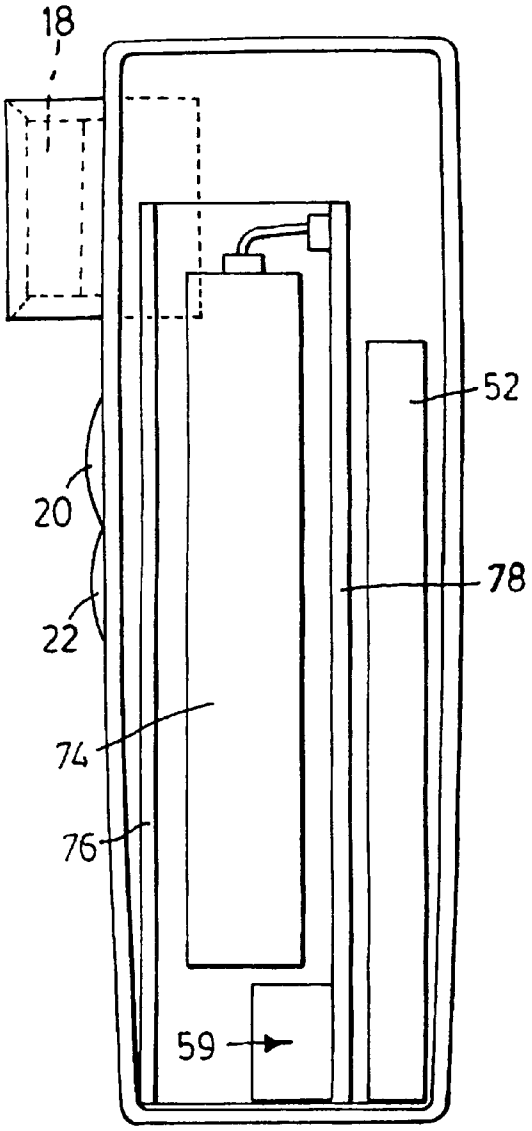


FIG. 4

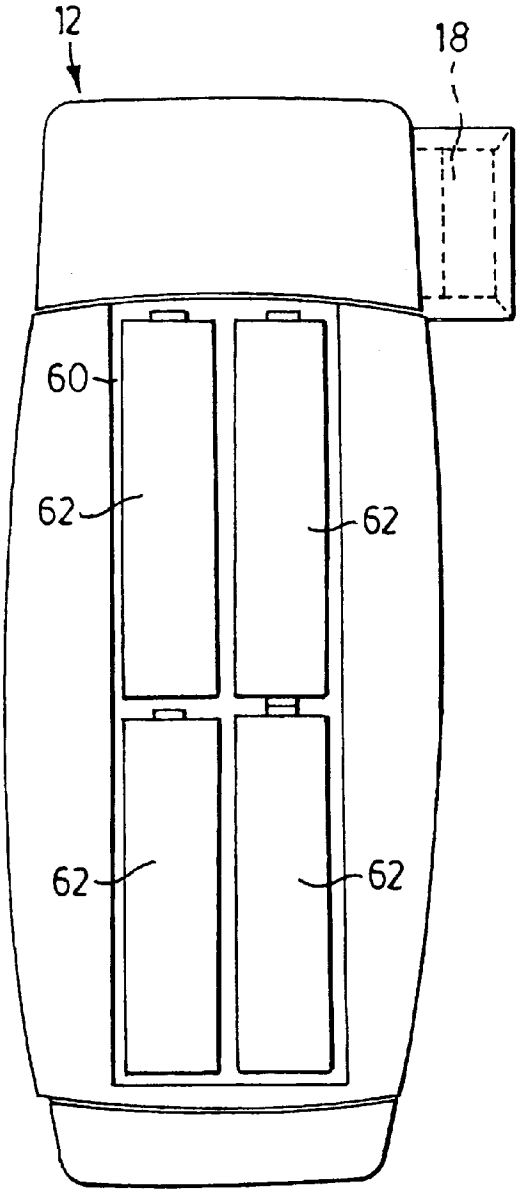


FIG. 5

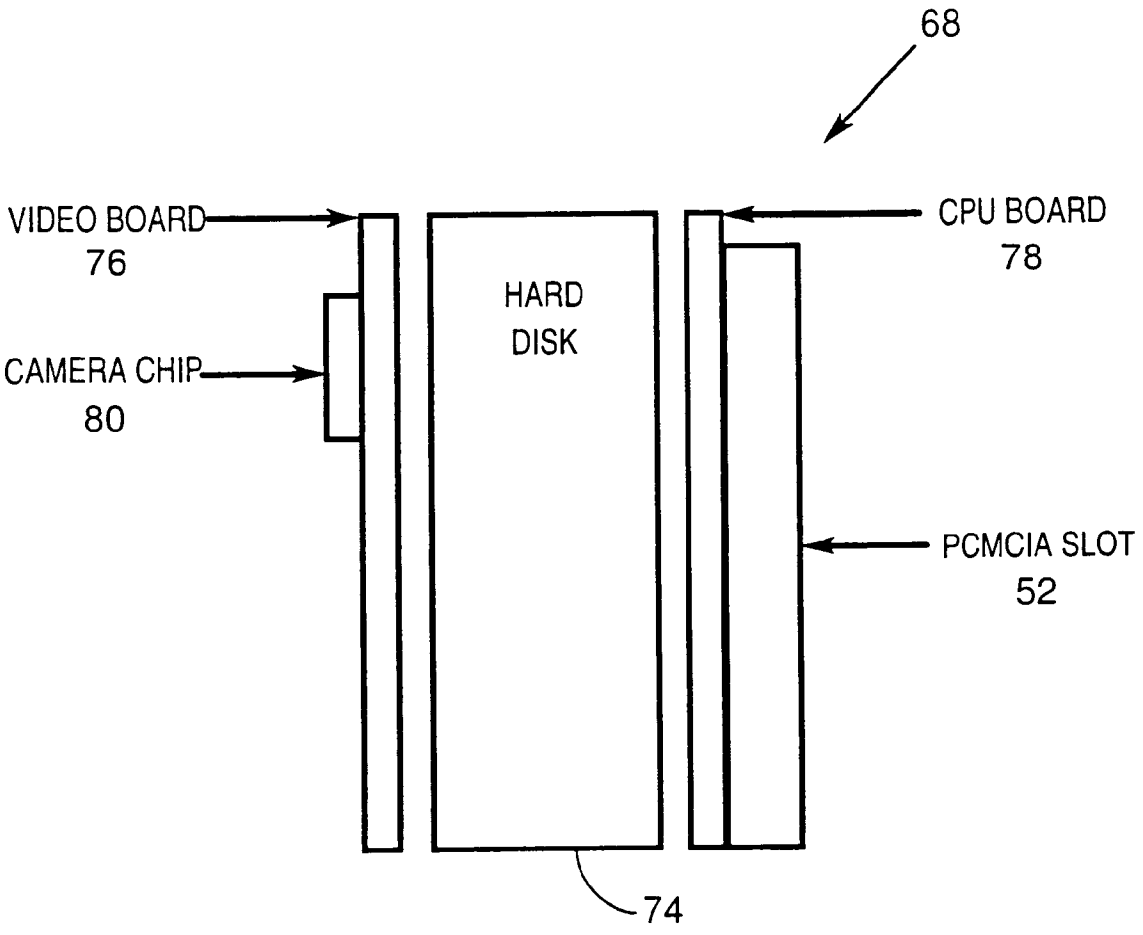

68
VIDEO BOARD
76
CAMERA CHIP
80
HARD
DISK
CPU BOARD
78
PCMCIA SLOT
52
74

FIG. 6

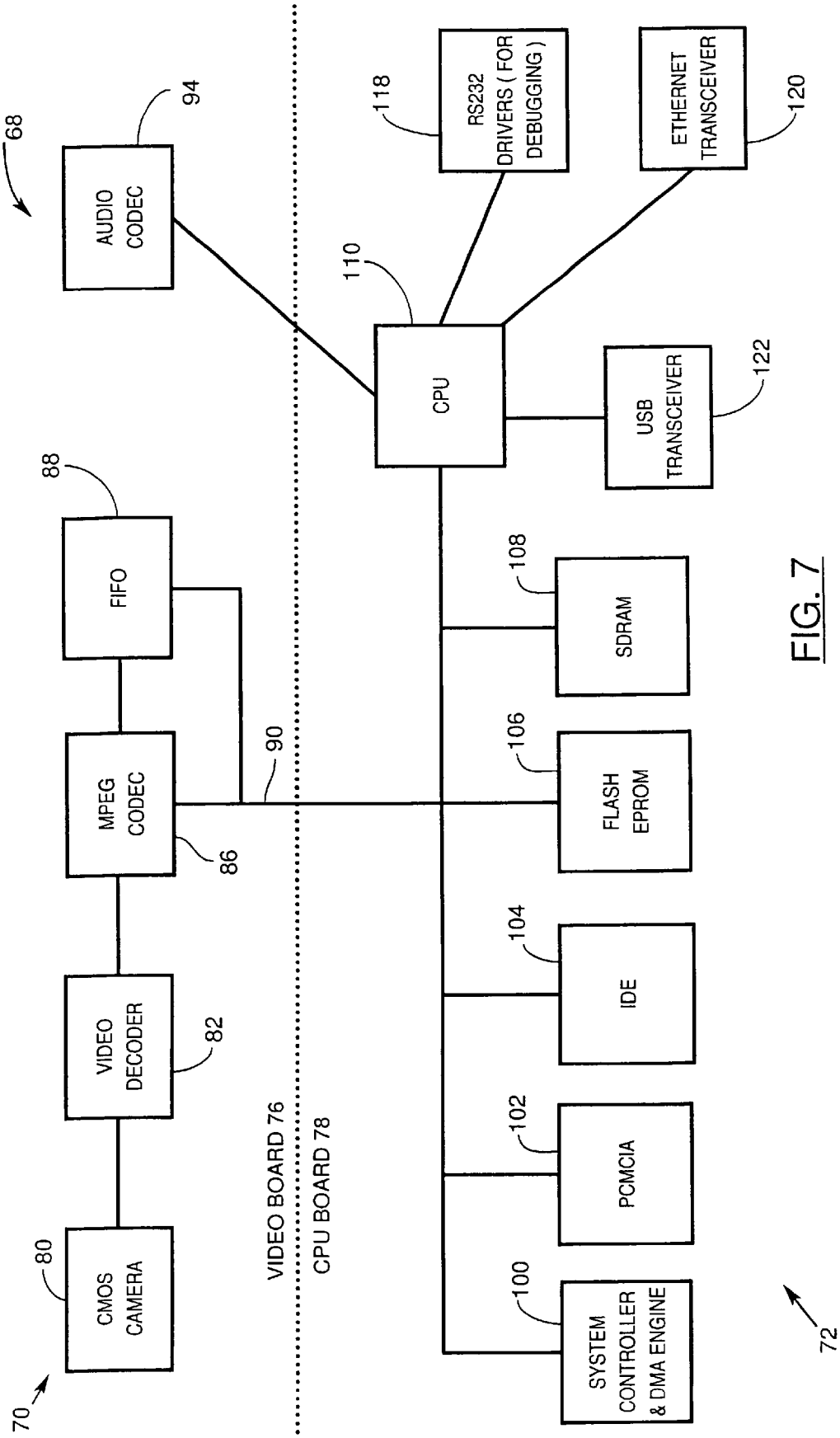

68
AUDIO CODEC
94
118
RS232 DRIVERS (FOR DEBUGGING)
ETHERNET TRANSCEIVER
120
110
CPU
USB TRANSCEIVER
122
88
FIFO
108
SDRAM
MPEG CODEC
90
106
FLASH EPROM
86
104
IDE
VIDEO DECODER
82
102
PCMCIA
VIDEO BOARD 76
CPU BOARD 78
80
CMOS CAMERA
100
SYSTEM CONTROLLER & DMA ENGINE
70
72

FIG. 7

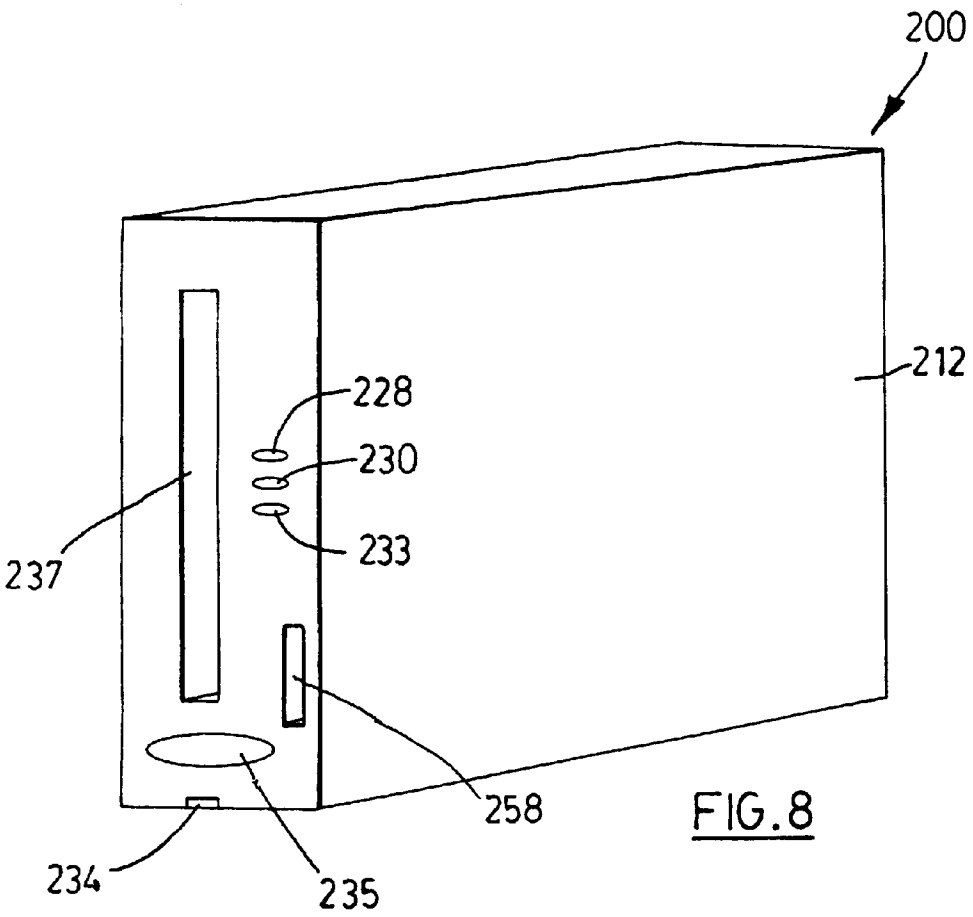


FIG.8

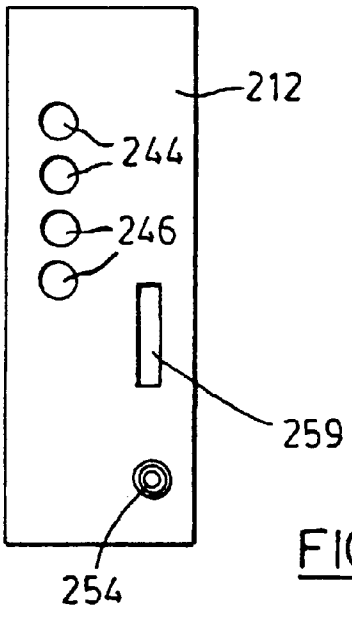


FIG.9

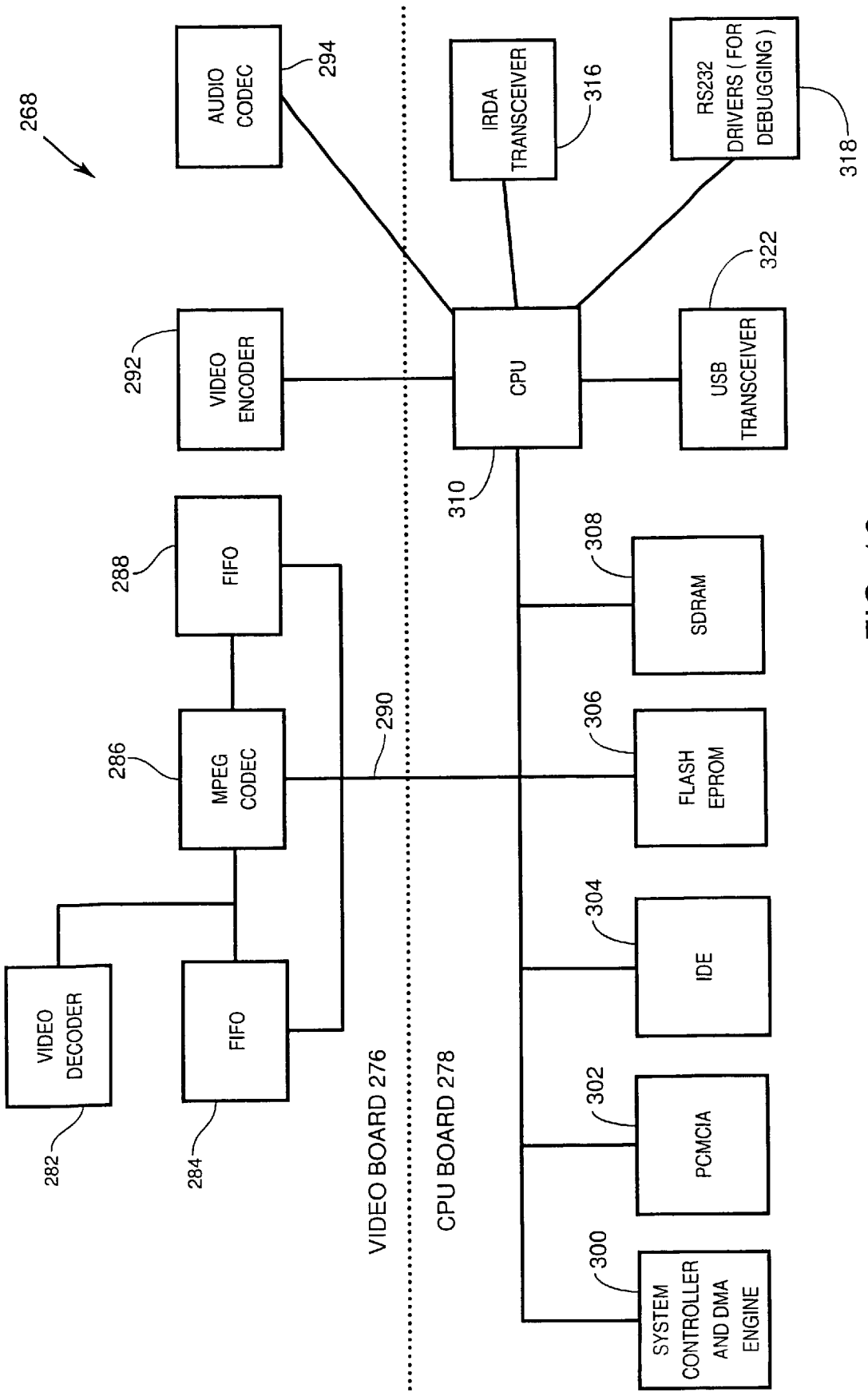

268
AUDIO CODEC
294
IRDA TRANSCEIVER
316
RS232 DRIVERS (FOR DEBUGGING)
318
322
VIDEO ENCODER
292
CPU
USB TRANSCEIVER
310
FIFO
288
308
SDRAM
MPEG CODEC
286
290
306
FLASH EPROM
VIDEO DECODER
FIFO
304
IDE
302
PCMCIA
300
SYSTEM CONTROLLER AND DMA ENGINE
282
284
VIDEO BOARD 276
CPU BOARD 278

FIG. 10

PORTABLE DEVICE FOR CAPTURING IMAGE AND SOUND DATA INCLUDING COMPACT MEMORY AND BOARD ARRANGEMENT

FIELD OF THE INVENTION

The present invention relates to cameras and in particular to a portable device for encoding image and sound data directly into a computer recognizable format and saving the encoded image and sound data to a hard disk drive in real time.

BACKGROUND OF THE INVENTION

Many computer users have a need for relatively low-resolution digital format video images with accompanying audio. Images of this nature are often published on the Internet and/or used for other amateur purposes. To acquire video images in digital form, computer users have in the past used low-quality CCD tethered cameras coupled directly to personal computers. Video images captured by these CCD cameras are sent directly to the personal computers and stored therein in a digital file format such as for example, .AVI or .MPEG formats, without audio accompaniment. Audio may be dubbed onto the digital video data afterwards using special software.

Computer users have also used standard video cameras to capture video images with accompanying audio. The captured video and audio data is then passed through a special device to convert the video and audio data into a format which allows the computer to store the video and audio data as .AVI or .MPEG files. Although this arrangement allows a computer user to acquire video images with accompanying audio in digital form, captured video images must undergo additional processing to place the video and audio data in a computer recognizable format.

It is therefore an object of the present invention to provide a novel device for encoding image and sound data directly into a computer recognizable format and saving the encoded image and sound data to a hard disk drive in real time.

SUMMARY OF THE INVENTION

According to one aspect of the present invention there is provided a portable device for encoding and saving image and sound data comprising:

- a housing including operator controls;
- a lens on said housing;
- at least one microphone on said housing;
- processor circuitry within said housing and communicating with said manually operable controls and said at least one microphone, said processor circuitry generating image data and capturing sound data received via said at least one microphone in response to user input made via said operator controls, said processor circuitry including an encoder to encode the image and sound data directly into a computer recognizable format; and
- a hard disk drive within the housing on which encoded image and sound data is saved.

In a preferred embodiment, the processor circuitry includes an image processor and a main processor. The image processor includes a digital image sensor receiving light via the lens and an image data encoder to encode digital image data output by the image sensor. The main processor includes a sound data encoder to encode sound data captured by the at least one microphone that accompanies the image data. The main processor receives the encoded image data from the image processor and stores the encoded image data and accompanying encoded sound data as a file to the hard disk drive in real time.

In one embodiment, the image data encoder includes a video decoder to digitize image data input into the device from an external source and an MPEG codec to encode image data from the image sensor and as well as digital image data output by the video decoder. Preferably, the MPEG codec can be conditioned to either a high or low resolution mode in response to user input made via the operator controls. In each of these modes, the image processor encodes continuous image data. It is also preferred that the MPEG codec can be conditioned to a still capture mode in response to user input made via the operator controls. In the still capture mode, the MPEG codec encodes discrete image frames.

In a preferred embodiment, the main processor includes an audio encoder communicating with the at least one microphone for digitizing sound data received via the at least one microphone. The main processor also includes a central processing unit executing MPEG encoding software for encoding the digitized sound data received from the audio encoder.

Preferably, the image processor is disposed on a first board within the housing and the main processor is disposed on a second board within the housing. The hard disk drive is sandwiched between the first and second boards in a compact arrangement.

According to another aspect of the present invention there is provided in combination, a portable device for encoding and saving image and sound data and a base station including a processor and a removable hard disk drive on which data saved by said device may be downloaded and saved, said device comprising:

- a housing including operator controls;
- a lens on said housing;
- at least one microphone on said housing;
- processor circuitry within said housing and communicating with said manually operable controls and said at least one microphone, said processor circuitry capturing image data and sound data in response to user input made via said operator controls, said processor circuitry including an encoder to encode the image and sound data directly into a computer recognizable format;
- a hard disk drive within the housing on which encoded image and sound data is saved; and
- at least one output port for coupling to said base station to allow encoded image and sound data saved to said hard disk drive to be downloaded to said base station.

The present invention provides advantages in that image and sound data is encoded directly into a computer recognizable format and saved on a hard disk drive in real time. As a result, a significant amount of sound and image data may be saved by the device. The hard disk drive is accessible by a host such as for example, a personal computer or base station, to allow sound and image data saved to the hard disk drive to be downloaded to the personal computer or base station in a quick and convenient manner.

BRIEF DESCRIPTION OF THE DRAWINGS

An embodiment of the present invention will now be described more fully with reference to the accompanying drawings in which:

FIG. **1** is a front elevational view of a device for encoding image and sound data directly into a computer recognizable format and saving the encoded image and sound data on a hard disk drive in real time in accordance with the present invention;

FIG. **2** is a perspective view taken from above and from the rear of the device of FIG. **1**;

FIG. **3** is a perspective view taken from the below and from the front of the device of FIG. **1**;

FIG. **4** is a right side elevational view of the device of FIG. **1**;

FIG. **5** is a left side elevational view of the device of FIG. **1**;

FIG. **6** is a schematic diagram of the electronics arrangement within the device of FIG. **1**;

FIG. **7** is a schematic block diagram of the device electronics;

FIG. **8** is a perspective view taken from above and from the front of a base station;

FIG. **9** is a rear elevational view of the base station of FIG. **8**; and

FIG. **10** is a schematic block diagram of the base station electronics.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Turning now to FIGS. **1** to **5**, a portable device for encoding image and sound data directly into a computer recognizable format and saving the encoded image and sound data to a hard disk drive in real time in accordance with the present invention is shown and is generally indicated to by reference numeral **10**. As can be seen, the device **10** includes a housing **12** configured to define a handgrip **14** at one side of the of the housing **12**. The front **16** of the housing **12** has a standard C/CS type lens mounting structure thereon to accommodate releasably a removable lens **18**. A microphone **19** is positioned to one side of the lens **18**. A record/pause key **20** and a new file key **22** are also disposed on the front **16** of the housing **12** adjacent the handgrip **14** to facilitate manual actuation by an operator. Above the microphone **19** is an optical viewfinder **24**, which extends through the housing **12**. The optical viewfinder **24** allows an operator to determine visually the field of view of the lens **18**.

Positioned below the optical viewfinder **24** on the rear **26** of the housing **12** are three light emitting diodes (LEDs) **28** to **32** respectively. LED **28** is a power indicator and is illuminated when the device **10** is on. LED **30** is a record indicator and is illuminated when the device **10** is conditioned to a record mode. If the record mode is paused, the LED **30** flashes. LED **32** is a memory capacity indicator. To one side of the LEDs is an on/off switch **34** in the form of a slider. The on/off switch **34** has three "on" settings, namely a high resolution setting, a low resolution setting and a still capture setting.

The bottom **40** of the housing **12** includes a recessed area **42**, which accommodates an external video input jack **44**, a pair of external audio input jacks **46**, an erase-all button **48** and a reset button **50**. A PCMCIA slot **52** is also provided in the bottom **40** of the housing **12** adjacent the recessed area **42**. A mount **54** for a tripod is provided in the bottom of the housing **12** to one side of the recessed area **42**.

Provided in the side of the housing **12** opposite the handgrip **14** is a DC power connector **56**, a universal serial bus (USB) port **58** and an Ethernet port **59**.

A battery compartment **60** is provided within the housing **12** behind the handgrip **14** and accommodates a plurality of batteries **62**. The battery compartment **60** is accessible via a removable access panel **64** on the top of the housing **12** to facilitate replacement of the batteries **62**.

Processor circuitry generally identified by reference numeral **68** in FIGS. **6** and **7** is disposed within the housing **12**. The processor circuitry **68** includes an image data processor **70** and a main processor **72**. A hard disk drive **74** such as the Travelstar 4GN sold by International Business Machines Corporation is also disposed within the housing **12** and communicates with the processor circuitry **68**. The components constituting the image data processor **70** are disposed on a board **76**. The components constituting the main processor **72** are disposed on a board **78**. The hard disk drive **74** is sandwiched between the boards **76** and **78** in a compact arrangement and is coupled to the main processor **72** via a 16-bit parallel bus. The hard disk drive **74** is rugged to withstand shock making the device **10** portable and reliable.

Turning now the FIG. **7**, the image data processor **70** and the main processor **72** are better illustrated. As can be seen, image data processor **70** includes a single chip CMOS digital colour video image sensor **80** such as that sold by Omnivision under model No. OV7610. The digital video image sensor **80** is disposed on the board **76** behind the lens **18** and is coupled to a video decoder **82**. Video decoder **82** is connected to an MPEG coder/decoder (codec) **86** such as that sold by C-Cube under model No. CLM4111RT. MPEG codec **86** is also connected to a first-in-first-out (FIFO) **88**. The FIFO **88** and the MPEG codec **86** are connected to a bus **90** leading to the main processor board **78**. An audio codec **94** is also disposed on board **76**.

The MPEG codec **86** includes a processor and accompanying microcode to encode image data into MPEG-1 format. The codec **86** is responsive to the main processor **72** and can be conditioned to a high resolution mode, a low resolution mode and a still capture mode depending on the "on" setting of switch **34** as will be described.

The main processor **72** includes a system controller and DMA engine **100**, a PCMCIA interface **102**, an integrated drive electronics (IDE) interface **104**, flash EPROM **106**, SDRAM **108** and a central processing unit (CPU) **110**, each of which is coupled to the bus **90**. CPU **110** in this embodiment is a Motorola MPC823 microprocessor, which excels in low power, portable, imaging applications. The microprocessor integrates a high-performance embedded core with a communication processor module that uses a specialized RISC processor for imaging and communications. The communication processor module performs digital signal processing (DSP) to encode audio data received from the audio codec **94** into MPEG-1 format. The CPU **110** is also coupled to an RS232 driver **118**, an Ethernet transceiver **120** and a USB transceiver **122** as well as the audio codec **94**. A power management circuit (not shown) is also disposed on the main processor board **78**. The power management circuit communicates with the battery compartment **60** and the DC power connector **56** and supplies appropriate power to the image processor **70**, the main processor **72** and the hard disk drive **74**.

The EPROM **106** stores a small boot-up program used to initialize the CPU **1110** and the peripherals of the device **10** when the device is powered up. The EPROM **106** also stores an operating system, in this example Windows CE. Windows CE is a portable, real time modular operating system including Microsoft programming interfaces. An OEM

adaptation layer communicates with the core of the operating system and device hardware including timers, the USB transceiver **122**, the PCMCIA interface **102** and the Ethernet transceiver **120**. Device drivers are also provided to interface device hardware and the operating system.

Applications software is also stored in the EPROM **106** and is executed by the CPU **110**. Execution of the application software controls the overall operation of the device **10** allowing the processor circuitry **68** to respond to actuation of the keys and buttons, illuminate the LEDs **28** to **32**, encode image and sound data, and read and write data to the hard disk drive **74**.

When the device **10** is turned on by sliding the switch **34** from its off position to one of its "on" settings, the power management circuit supplies power from either the batteries or a power source coupled to the DC power connector **56**, to the image data processor **70**, main processor **72** and hard disk drive **74**. The main processor **72** in turn illuminates the LED **28**. If the power level of the batteries falls below a threshold, the main processor **72** flashes the LED **28** to signify a low power condition.

At power up, the CPU **110** executes the boot-up program in the EPROM **106** to initialize the device **10** placing the device **10** into a ready state. At this point, the CPU **110** monitors the buttons and keys and responds to manual actuation of the buttons and keys in the appropriate manner. If the switch **34** is positioned to the high resolution setting, the CPU **110** conditions the MPEG codec **86** to a high resolution mode (352×240 resolution). If the switch **34** is positioned to the low resolution setting, the CPU **110** conditions the MPEG codec **86** to a low resolution mode (176×120 resolution). If the switch **34** is positioned to the still capture setting, the CPU **110** conditions the MPEG codec **86** to a still capture mode (640×480 resolution).

In general, when the record/pause key **20** is pressed, the device **10** encodes and saves image and sound data in a file on the hard disk drive **74** in real time. If the MPEG codec **86** is conditioned to either the high or low resolution mode, the device **10** encodes and saves continuous digital image and sound data to the hard disk drive **74**. Pressing the record/pause key **20** again in this mode, stops data acquisition. When recording has been paused, the main processor **72** flashes LED **30**. If the MPEG codec **86** is conditioned to the still capture mode, the device **10** encodes and saves a single digital image frame on the hard disk drive **74** when the record/pause key **20** is pressed. If the record/pause key **20** is held in a pressed conditioned, the device **10** encodes and saves a series of digital image frames on the hard disk drive **74** until the record/pause key **20** is released. Further details of the data encoding and saving will now be described.

If the switch **34** is in either its high or low resolution setting and the record/pause key **20** is pressed, the CPU **10** conditions the MPEG codec **86** to acquire directly and continuously image data from the CMOS image sensor **80**. The MPEG codec **86** in turn converts the image data into MPEG-1 format having a resolution dependent on its mode setting and outputs the encoded image data to the FIFO **88**.

Encoded image data loaded into FIFO **88** is conveyed to the main processor **72** via the bus **90** and is cached. During the acquisition of the image data, accompanying sound data is also acquired via the microphone **19**. Audio picked up by the microphone **19** is converted into digital form by the audio codec **94** before being conveyed to the CPU **110**. The CPU **10** encodes the digital audio into MPEG-1 format and combines the digital audio with the encoded image data. The encoded image and sound data is then saved to the hard disk drive **74** as a file via the IDE interface **104**. Files saved on the hard disk drive **74** are sequentially numbered using a naming convention that allows for up to an eight character name followed by a three letter extension. The first three characters of the name are company identifiers while the following five characters are an alphanumeric series.

Encoded image and sound data acquired by the device **10** during each recording session is saved under a single file name on the hard disk drive **74** until the new file key **22** is pressed. During a recording session, if the new file key **22** is pressed, the CPU **10** closes the current file and creates a new file on the hard disk drive **74** for the subsequent encoded image and sound data.

If the switch **34** is in its still capture setting when the record/pause key **20** is pressed, the CPU **10** conditions the MPEG codec **86** to grab a single frame from the CMOS image sensor **80**. In this mode, the MPEG codec **86** converts the digital image data into JPEG format and outputs the encoded image data to the FIFO **88**. The encoded image data loaded into FIFO **88** is conveyed to the main processor **72** via the bus **90** and is cached before being saved as a file to the hard disk drive **74** by the CPU **110**.

If the MPEG codec **86** is in the still capture mode and the record/pause key **20** is held in a pressed condition, the MPEG codec **86** is conditioned to grab a series of image frames from the CMOS image sensor **80** for as long as the record/pause key **20** is held. Each grabbed image frame is converted into JPEG format before being saved to the hard disk drive **74** as a separate file in the manner described above.

If desired video image data can input into the device **10** from an external source via video input jack **44**. In this case, the input video image data received from the external source is processed by the video decoder **82**. The digital image data output by the video decoder **82** is then passed to the MPEG codec **98** and processed accordingly, depending on the "on" setting of the switch **34**.

In addition, accompanying audio can be input into the device **10** via the external audio input jacks **46**. When audio is received from an external source via the audio input jacks **46**, the microphone **19** is disabled. The audio is converted into digital format via audio codec **94** and is processed in the manner described previously.

As files are stored on the hard disk drive **74**, the CPU **110** monitors disk space and illuminates the LED **32** depending on the amount of memory available on the hard disk drive **74**. Specifically, when the hard disk drive **74** is less than 50% full, the LED **32** is illuminated green. When the hard disk drive is between 50% and 75% full, the LED **32** flashes green. When the hard disk drive is more than 75% full, the LED **32** flashes red. When the hard disk drive **74** is full, the LED **32** is illuminated red. Hard disk drive memory can be made available by downloading the files to a host and then conditioning the host to send an erase file instruction to the CPU **110** or alternatively by pressing the erase-all key **48**. When the erase-all key **48** is pressed, the CPU **110** completely erases the hard disk drive **74**.

If the reset key **50** is pressed, the CPU **110** re-executes the boot-up program in the EPROM **106** to re-initialize the device **10**.

The USB connector **58** allows the device **10** to be coupled directly to a personal computer or to a base station via a cable. When this is done, the hard disk drive **74** can be accessed by the personal computer or base station via the USB transceiver **122** and the CPU **110** allowing files thereon

to be downloaded, erased, renamed etc. The Ethernet port **59** allows the device **10** to be connected directly to a computer network. In this manner, files on the hard disk drive **74** can be accessed by a computer coupled to the computer network via the Ethernet transceiver **120** and the CPU **110**.

The PCMC1A slot **52** accommodates PCMCIA type II cards including PCMCIA network cards, PCMCIA modem cards etc. allowing the device **10** to communicate directly with third party hardware and applications via the PCMCIA interface **102** and the CPU **110**.

The RS232 driver **118** acts between the CPU **10** and an internal RS232 connector, and allows device software to be debugged.

Turning now to FIGS. **8** to **10**, a base station for coupling to the device **10** is shown and is generally indicated to by reference numeral **200**. As can be seen, the base station **200** includes a housing **212**. Provided on the front face of the housing **212** are an on/off switch **234**, a USB port **258**, a power LED **228**, a record LED **230** and a play LED **233**. An infrared sensor **235** and a drive bay **237** accommodating a removable hard disk drive such as the Castlewood ORB are also provided on the front face of the housing **212**.

Provided on the rear face of the housing **212** are video input and output jacks **246**, audio input and output jacks **246**, a DC power connector **254** and a second USB port **259**.

Processing circuitry generally identified by reference numeral **268** is provided in the housing **212** and is similar to the processor circuitry within the device **10**. As can be seen, the processing circuitry **268** includes a video board **276** and a CPU board **278**. Disposed on the video board **276** is a video decoder **282** for receiving input video data via the video input jack **244**. Video decoder **282** is connected to a FIFO memory **284** and to an MPEG codec **286**. MPEG codec **286** is also connected to a second FIFO **288**. The FIFOs **284** and **288** and the MPEG codec **286** are connected to a bus **290** leading to the CPU board **278**. A video encoder **292** and an audio codec **294** are also disposed on the video board **276**.

Disposed on the CPU board **278** is a system controller and DMA engine **300**, a PCMCIA interface **302**, an IDE interface **304**, flash EPROM **306**, SDRAM **308** and a central processing unit (CPU) **310**, each of which is coupled to the bus **290**. The CPU **310** is also coupled to an IRDA transceiver **316**, an RS232 driver **318**, and USB transceivers **322** as well as the video encoder **292** and the audio codec **294**.

The device **10** can be connected to the base station **200** by a cable coupled to the USB ports **58** and **258** respectively. This allows files stored on the hard disk drive **74** to be downloaded into the base station **200** via the USB transceiver **322** and the CPU **310** and saved on the removable hard disk drive. The hard disk drive can be removed from the base station **200** via the bay **237** and transported to any desired location.

Image data from an external source can also be encoded and saved on the removable hard disk drive by inputting the video image data via the video input jack **244**. The input video image data is processed in a similar manner to that described above with reference to device **10**. Accordingly, the input video image data is digitized by video decoder **282** before being encoded by MPEG codec **286**. The encoded image data is then directed to FIFO **288** before being downloaded by the CPU **310** and saved on the hard disk drive. Accompanying sound data received via the audio input jack **246** is processed by the audio codec **294** and the CPU **310** in the same manner as described previously with reference to device **10** and is saved on the hard disk drive with the image data.

The encoded image and sound data stored on the hard disk drive within the base station **200** may be output to a personal computer via USB transceiver **322** and the USB port **259** or may be output to a playback unit. In the latter case, the CPU **310** conveys the image data to the MPEG codec **286** which decodes the image data. The decoded image data is stored in FIFO **284**. The image data stored in FIFO **284** is retrieved by the CPU **310** and is conveyed to the video encoder **292** before being output to the playback unit via the video output jack **244**. Accompanying sound data is decoded by the CPU **310** and is conveyed to the audio codec **294** before being output to the playback unit via the audio output jack **246**.

The infrared sensor **235** and IRDA transceiver **316** allow a user to control operation of the base station **200** by entering input commands using a hand-held remote control unit in a well known manner.

Although a preferred embodiment of the present invention has been described, those of skill in the art will appreciate that variations and modifications may be made without departing from the spirit and scope thereof as defined by the appended claims.

What is claimed is:

1. A portable device for encoding and saving image and sound data comprising:

a housing including operator controls;

a lens on said housing;

at least one microphone on said housing;

memory within the housing to which encoded image and sound data is saved;

an image processor mounted on a first board within said housing, said image processor capturing image and sound data; and

a main processor mounted on a second board within said housing, said main processor receiving captured image and sound data from said image processor and saving said image and sound data to said memory, wherein said memory is sandwiched between said first board and said second board in a compact arrangement.

2. A device as defined in claim **1** wherein said image processor includes an image sensor, a video decoder and an MPEG codec, said video decoder digitizing image data received from an external source, said MPEG codec encoding image data output by said image sensor and by said video decoder.

3. A device as defined in claim **2** wherein said MPEG codec includes high and low resolution modes, said MPEG codec being conditioned by said main processor to one of said high and low resolution modes in response to user input made via said operator-controls, said image processor capturing continuous image data when said MPEG codec is in one of said high and low resolution modes.

4. A device as defined in claim **2** wherein said main processor includes a central processing unit and an audio encoder communicating with said at least one microphone, said audio encoder digitizing sound data received via said at least one microphone, said central processing unit executing MPEG encoding software and encoding digitized sound data received from said audio encoder.

5. A device as defined in claim **3** wherein said MPEG codec further includes a still capture mode, said MPEG codec being conditioned by said main processor to said still capture mode in response to user input made via said operator controls, said MPEG codec capturing discrete image frames when said MPEG codec is in said still capture mode.

6. A device as defined in claim **3** wherein said MPEG codec encodes said image data into MPEG-1 format.

7. A device as defined in claim **5** wherein said operator controls include a plurality of manually actuable keys on said housing, said plurality of keys including a record key and a mode select key, said main processor conditioning said MPEG codec to one of said high resolution, low resolution and still capture modes in response to manual actuation of said mode select key and conditioning said image processor to capture and encode image data in response to manual actuation of said record key.

8. A device as defined in claim **7** wherein said plurality of keys further includes a new file key, said main processor storing encoded image and sound data in separate files to said hard disk drive in response to manual actuation of said new file key.

9. A device as defined in claim **3** wherein said housing includes at least one output port to enable encoded image and sound data saved to said hard disk drive to be downloaded to a host.

10. A device as defined in claim **9** wherein said at least one output port includes at least one of a universal serial bus, a PCMCIA slot and an Ethernet port.

11. A device as defined in claim **10** wherein said host is a base station, said device and base station being connected by a cable coupled to a universal serial bus connector on each of said device and base station.

12. In combination, a portable device for encoding and saving image and sound data and a base station including a processor and a removable hard disk drive on which data saved by said device is downloaded and saved, said device comprising:

a housing including operator controls;

a lens on said housing;

at least one microphone on said housing;

a hard disk drive within the housing on which encoded motion and sound data is saved;

an image processor mounted on a first board within said housing, said image processor capturing image and sound data;

a main processor mounted on a second board within said housing, said main processor receiving captured image and sound data from said image processor and saving said image and sound data to said memory, wherein said memory is sandwiched between said first board and said second board in a compact arrangement; and

at least one output port for coupling to said base station to allow encoded and sound data saved on said hard disk drive to be downloaded to said base station.

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